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Alexithymia and the Anxiolytic Effect of Endurance Running.

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Abstract

Individuals high in alexithymia use high-risk sport to regulate their anxiety. Given the conceptual similarities between arduous high-risk sports and extreme endurance running, we investigated the relationship between alexithymia and the anxiolytic effects of endurance running. We measured marathon and ultramarathon runners (n = 35) on alexithymia, and pre- and post-race anxiety. Bootstrapped regression analyses using MEMORE revealed that alexithymia moderated the relationship between pre- and post-race anxiety such that there was a significant anxiety reduction for individuals high in alexithymia only. In conclusion, extreme endurance running provides an emotion regulation function for individuals high in alexithymia. The modest sample size points to the need for replication and further exploration.

Keywords: emotion regulation, anxiety, ultramarathon, affect, coping.

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Emotion regulation refers to the management of one's emotions including initiating and regulating the type, intensity, and duration of emotion (Gross & Thompson, 2007), responses to emotional situations and the instigation of emotions to alter behaviors (Gross & Muñoz, 1995). Emotion regulation can occur either consciously, through employing strategies to control emotions, or through unconscious processes. It is necessary to be able to regulate emotions when faced with intense, distressing, or disruptive emotions such as anger, sadness, or anxiety (Williams et al., 2009). An inability to regulate emotions effectively has been suggested as a key feature in a range of psychological disorders including generalized anxiety disorder (Mennin et al., 2002) and borderline personality disorder (Lieb et al., 2004). Poor emotion regulation can lead to maladaptive coping strategies that are attempts to regulate emotion synthetically in the absence of more adaptive regulation strategies. These attempts include substance abuse (Weiss et al., 2012), self-harm (Gratz, 2003), and aggressive behavior toward others (Bushman et al., 2001; Jakupcak et al., 2002).

Alexithymia is a personality trait that reflects an inability to identify or describe one's own emotions, leading to difficulties expressing, understanding, or regulating emotions, and difficulties with interpersonal relations (Bagby et al., 1994a). Alexithymia and the subsequent difficulties with emotion regulation has been suggested as a transdiagnostic mechanism for many psychological disorders (Sloan et al., 2017) and the maladaptive coping strategies associated with them, such as self-harm (Hasking & Claes, 2020). Alexithymia has been commonly associated with anxiety disorders (De Berardis et al., 2008; Honkalampi et al., 2018) and elevated anxiety (Karukivi et al., 2014), likely due to the alexithymic difficulty in regulating and resolving negative emotions that arise from stressful aspects of life. This unresolved negative affect then persists, which causes intense feelings of unregulated anxiety

(Lumley, 2000). The emotional dysfunction itself has been suggested to cause further anxiety that the individual cannot then regulate (Honkalampi et al., 2018).

With the associated elevated anxiety and difficulty regulating emotions, it is unsurprising that alexithymia has been strongly linked with the use of maladaptive emotion regulation strategies, such as self-harm (Norman et al., 2020). The mechanism underlying self-harm is thought to be the externalization and simplification of intense emotion, through the experience of a readily identifiable and controllable feeling, in this case pain (Chapman et al., 2006; Kirkcaldy et al., 2007). The act of self-harm provides individuals who suffer from emotional dysregulation a means to express and to understand their emotions, especially anxiety (Gratz, 2003).

Equally, research has shown that individuals high in alexithymia can glean emotion regulation benefits via other, more adaptive, means. Specifically, researchers have found that high-risk sports (Bonnet et al., 2017; Panno et al., 2019; Woodman et al., 2010) offer a particularly fertile emotion regulation framework for individuals high in alexithymia (Woodman et al., 2009).

Fenichel's (1939) work on the counter-phobic attitude provides the groundwork for a potential explanation as to why individuals may receive an anxiolytic benefit from high-risk sports. Fenichel proposed that while some individuals may deliberately (and quite determinedly) avoid anxiety-provoking situations that may cause them fear or discomfort, others present with a counter-phobic attitude where they purposefully engage with such situations. Specifically, individuals who experience an unidentifiable generalized anxiety will seek to externalize that feeling to better understand it, hence they seek out situations that provide an easily identifiable source of anxiety. Fenichel proposed high-risk sport as an environment that offers the opportunity to identify and experience a more externally derived anxiety. When participants then control or overcome that anxiety by participating in the sport,

they achieve a perceived agency over their emotions that they do not experience in everyday life. Researchers have since built on this, suggesting that the mechanism that underlies the anxiolytic benefit of the high-risk sport environment for alexithymic individuals is that they experience a readily identifiable and intense emotion, namely fear (Barlow et al., 2015; Castanier et al., 2011). The regulation of that fear provides individuals with a sense of agency over their own emotion regulation, which they can then transfer to their everyday intrapersonal and interpersonal life (Barlow et al., 2013).

According to this anxiety regulation framework, Woodman and colleagues (2008) measured state anxiety before, immediately after, and 70-90 minutes after completing a skydive. They found that only alexithymic individuals experienced a significant pre- to post-jump reduction in anxiety, with non-alexithymic individuals experiencing no such fluctuations in anxiety (see also Woodman et al., 2009). Of note, the alexithymic group experienced a significant rise in anxiety 90 minutes post-skydive, although it remained significantly lower than their pre-jump anxiety. The authors theorized that the reduction in anxiety for the alexithymic group was brief because the underlying source of the anxiety had not been addressed (see Fenichel, 1939). This short-term emotion regulation benefit may lead to alexithymic individuals frequently needing to repeat the high-risk activity to glean the emotion regulation benefits.

This repetitive need to regulate emotions via high-risk sport could help to explain the reported links between alexithymia and exercise addiction. Exercise addiction can be classed as a pattern of habitual and excessive exercise that increases the risk of experiencing physical harm or injury (Allegre et al., 2007). Manfredi and Gambarini (2015) found that 100% of exercise-addicted participants (n = 12) were alexithymic. Despite the clear limitation of the small sample size, this finding is further supported in the sparse literature assessing this topic. For example, Bossard and Miller (2009) assessed the prevalence of alexithymia and exercise

dependence in an adult sample and found that 40% of those with exercise addiction were alexithymic. Furthermore, in a large sample of university students (n = 600), latent profile analysis suggested two subtypes of exercise addiction, both strongly related to aspects of alexithymia (Van Landeghem et al., 2019). These findings support the idea that alexithymic individuals may derive greater psychological benefits from extreme forms of exercise than those who have less difficulty regulating their emotions.

Certain types of high-risk sport appear to provide greater opportunity for emotion regulation than others. For example, Barlow and colleagues (2013) examined the motives of individuals who participated in skydiving or mountaineering and found that emotion regulation and agency were a greater motive for mountaineers than they were for skydivers, and that these benefits were, for a period, transferable into everyday life. This finding suggests that the emotion regulation benefits of high-risk sports may be especially prevalent in challenging activities that require prior organization and prolonged participation, as opposed to shorter adrenaline-based activities (see also Woodman et al., 2010). In line with the counter-phobic theory (Fenichel. 1939), this benefit may stem from these environments offering an easily identifiable source of anxiety that participants then need to control for a longer period, requiring greater agency over their emotions than shorter activities. This prolonged mastery over externally derived anxiety is thought to provide a sense of emotional agency that transfers briefly into everyday life (Barlow et al., 2013; Woodman et al., 2010).

Collectively, these findings suggest that individuals high in alexithymia may use extreme forms of exercise to regulate their emotions, specifically their anxiety. In short, for individuals high in alexithymia, extreme forms of exercise may be a primary emotion regulation strategy. In this study, we aim to extend this area of research into the world of extreme endurance running.

Extreme endurance running shares characteristics with the high-risk sport domain, most notably, with the types of high-risk sport that have been shown to provide an agentic emotion regulation function (Barlow et al., 2013; Woodman et al., 2010). Indeed, endurance events are prolonged arduous physical challenges that require prior training and organization to complete. For example, in a qualitative phenomenological study of the motivation for marathon running, Rupprecht and Matkin (2012) found that the struggle and pain of marathon running were central to motivating runners through each marathon. The runners highlighted that they felt very strong emotions, which they could only derive from marathon running, and that this feeling was 'addictive'. This finding points to an emotion regulation function of endurance running that mirrors that found in the high-risk sport domain (e.g., Barlow et al., 2015). Specifically, endurance runners are deliberately and consistently seeking an anxiety-inducing environment that involves a significant amount of pain and struggle, but where they also experience clear and strong emotions. The assertion that this feeling is 'addictive' suggests that such runners are gaining psychological benefits that outweigh any discomfort that they might experience. These findings help to crystalize the suggestion that one might view endurance running as a mechanism for emotional regulation, especially for those who lack other means of regulating their emotions (i.e., who are high in alexithymia).

The aim of this study was to investigate the anxiolytic effect of endurance running, and the role of alexithymia therein. Specifically, we aimed to provide initial support for endurance running as a potential emotion regulation strategy for individuals high in alexithymia and open the way for more in-depth research into this topic. This study will increase the understanding of the motivation for endurance running for those with difficulties in regulating their emotions. If endurance running can fulfil an emotion regulation function, it may help to reduce the likelihood of more maladaptive strategies, such as self-harm and substance abuse.

Hypotheses

We hypothesize that alexithymia will moderate the relationship between pre- and post-race anxiety, such that alexithymia will attenuate the relationship between pre-race anxiety and post-race anxiety. Specifically, we will see a considerably greater anxiolytic effect for those endurance runners who are relatively high in alexithymia than for those low in alexithymia.

Method

Participants

To meet the inclusion criteria for this study, we required participants to be over the age of 18 years and to have completed the full distance of the marathon or ultramarathon event. Thirty-five runners (16 men, 19 women) aged between 29 and 63 years (M_{age} = 46.14 years, *SD* = 8.17) provided pre- and post-race data. The participants' running experience ranged from one year to 38 years (*M* = 9.3 years, *SD* = 9.4). Four of the events were marathon distance and 31 were ultramarathons (nine under 75km, 14 between 76km and 100km, and eight over 100km). We recruited participants through Facebook groups and events for marathon and ultramarathon runners. We promoted the study by posting an advert with a link to the information sheet on the social media platforms and through word of mouth.

Measures

State Anxiety Inventory (SAI; Spielberger et al., 1983). As we were interested in how anxious participants were at a given moment, we used the 20-item SAI, which was designed to measure the intensity of anxiety as an emotional response at a given time. We used this measure (rather than a competition-specific anxiety measure), as we were interested specifically in the global everyday anxiety that the participants were feeling pre- and post-race (not their competition-specific anxiety). All items (e.g., *I am worried*) are scored on a

four-point Likert scale, labelled for how the participant feels *right now* (i.e., *not at all, somewhat, moderately so, very much so*). Cronbach's alpha in this sample was .92.

Toronto Alexithymia Scale (TAS-20; Bagby et al., 1994a, b) was the measure of alexithymia. This measure contains three sub-scales across 20 items: difficulty identifying one's feelings (DIF, seven items; e.g., *I am often confused about what emotion I am feeling*), difficulty describing one's feelings (DDF, five items; e.g., *It is difficult for me to find the right words for my feelings*) and externally orientated thinking (EOT, eight items; e.g., *I prefer to let things happen rather than to understand why they turned out that way*). The items are rated on a five-point Likert scale from 1 (*strongly disagree*) to 5 (*strongly agree*). TAS-20 data are best analyzed as a continuous variable (Bagby et al., 1994a) with scores ranging from 20 to 100. Cronbach's alpha for the TAS-20 in this sample was .87.

Design

The study was a quasi-experimental repeated-measures design with data collected pre-race and post-race. We collected data via two online questionnaires created in Qualtrics (Qualtrics, Provo, UT).

Procedure

This study received institutional ethical approval from Bangor University's School of Sport, Health and Exercise Sciences Ethics Committee. Before starting the first questionnaire, participants completed an information sheet and an informed consent form. Participants provided consent via a forced-response check box without which they were unable to proceed to the study questionnaires.

Participants completed the first questionnaire (demographics, the TAS-20, and the SAI) the day before the running event. The questionnaire concluded with a request for participants' email address to allow us to send them the second questionnaire and instructions regarding the timing of this.

We asked participants to complete the second questionnaire two days after the event to establish post-race state anxiety (SAI). We deemed two days to be sufficiently far from the race to allow any immediate post-race affect (e.g., relief) to subside and sufficiently close to the race to detect anxiety changes with minimal contamination from other life events. To ensure that the participants met the inclusion criteria, the questionnaire commenced with a short section detailing the date and distance of the event (marathon, 50-75km, 76-100km and 101km+), and whether they completed the full distance. The study concluded with a message thanking the participants for their time.

Analyses

We conducted a priori power analysis using G*Power3 (Faul et al., 2007) for testing the within-subjects factor of a repeated measures model with a medium effect size ($d = .25$) and an alpha level of .05. The result showed that a total sample of 31 participants would be required to achieve a power of .80. Statistical analyses were conducted using SPSS (IBM, Armonk, NY) and MEMORE (Montoya, 2019), an SPSS macro designed to estimate moderation in two-instance repeated measures models. MEMORE implements the regression procedures initially described by Judd et al. (2001) for testing interactions in moderation models. This procedure involves first regressing the predictor variable ($\hat{Y}_1$), and then the outcome variable ($\hat{Y}_2$), on the moderator. To determine if $\hat{Y}_1$ differs from $\hat{Y}_2$, the difference ($Y_d = Y_1 - Y_2$) is then regressed on the moderator. A slope that differs from zero signifies a significant moderation (see Judd et al., 2001). Further to this, MEMORE provides bootstrapped confidence intervals and allows probing of the interaction using the Johnson-Neyman procedure.

Using MEMORE, we explored the hypothesized within-subjects moderation of alexithymia on pre-race to post-race anxiety. This method allowed us to probe the alexithymia × anxiety interaction while maintaining both variables as continuous, rather than

dichotomizing (or similar) participants into high and low groups, as would be required by ANOVA. Another benefit of utilizing this method for the present sample is that it is not bound by the large sample assumptions typically underlying estimation procedures in multilevel modelling (Judd et al., 2001).

Results

Preliminary analyses

Table 1 displays the means, standard deviations, and bivariate correlations between the variables. TAS-20 scores in this sample ranged from 30 to 73. ANOVA confirmed that there was no significant difference between distances for alexithymia, $F(3,31) = 1.36$, $p = .27$. A 4 (distance group) × 2 (pre-race and post-race anxiety) mixed-model ANOVA revealed a significant main effect for time; anxiety reduced from pre- to post-race, $F(3,31) = 6.36$, $p = .02$. There was no significant main effect for distance, $F(3,31) = 1.93$, $p = .15$, and no interaction, $F(3,31) = 2.09$, $p = .12$. The difference in anxiety was thus not dependent on the distance of the race.

Main analyses

The MEMORE (Montoya, 2019) results provided support for the hypothesis that alexithymia moderates the relationship between pre- and post-race anxiety (see Table 2). Specifically, as hypothesized, the results revealed that individuals high in alexithymia experienced a significantly greater reduction in anxiety from pre- to post-race than individuals low in alexithymia (see Figure 1).

As is common in research on alexithymia (e.g., Woodman et al., 2010; see also Woodman et al., 2019), we supplemented the total TAS-20 score analysis with three additional moderated regression analyses, replacing the TAS-20 total score with each of the three TAS-20 factors in turn as the moderator (see Table 3). The *Difficulty Identifying Feelings* (DIF) factor and the *Difficulty Describing Feelings* (DDF) factor both significantly

moderated the relationship between pre- and post-race anxiety, such that individuals who scored highly on DIF and DDF attained a greater anxiety reduction post-race than those with low scores on these factors. Conversely, the *Externally Orientated Thinking* (EOT) factor did not significantly moderate the relationship between pre-race and post-race anxiety.

Discussion

We aimed to explore the anxiolytic effect of endurance running for individuals with limited capacity for emotion regulation (i.e., high in alexithymia). Consistent with our hypothesis, alexithymia had a moderating effect on the relationship between pre-race and post-race anxiety. Specifically, we found that there was a considerably greater anxiety reduction for those high in alexithymia. The main features of alexithymia drove this finding, namely *Difficulty Identifying Feelings* and *Difficulty Describing Feelings* (cf. Woodman et al., 2010).

This finding is consistent with Woodman and colleagues' (2008, 2009) findings in which only skydivers who were high in alexithymia experienced an emotion regulation benefit from skydiving, namely through a reduction in anxiety. The results thus support the suggestion that endurance running may also be a means of emotion regulation for individuals high in alexithymia. Given that runners high in alexithymia likely feel agentic in this emotional benefit process (see Bandura, 1997; Woodman et al., 2010), it is likely that they will transfer this benefit back into their everyday intrapersonal and interpersonal life after the race. Indeed, it appears that the control that runners exert, so as not to yield to pain and thus stop running (Rupprecht & Matkin, 2012), gives them a sense of agency that they can transfer to other areas in which they might be struggling to maintain control (Lupton & Tulloch, 2003). Such a cyclical process of increased alexithymia-derived anxiety before the race to post-race reductions in anxiety could go some way to explaining why alexithymia is related to extreme forms of exercise, including addiction (cf. Manfredi & Gambarini, 2015).

Nonetheless, although the runners may perceive endurance running as an effective anxiolytic process, it is unlikely to be lastingly effective given that the underlying anxiety has not been addressed (see also Barlow et al., 2013). Indeed, Woodman and colleagues (2008) found that alexithymic women's anxiety decreased immediately following a skydive but rose significantly 70-90 minutes post-jump. Mountaineers and transatlantic rowers have described feeling better able to cope with emotionally charged relationships following an expedition and maintaining this ability for a short time after participating (Woodman et al., 2010). Future research may wish to address the possibility of coping skills gained during endurance running events being transferred into everyday life, as has been observed in the high-risk sport domain (Holmbom et al., 2017; Woodman et al., 2010). Further to this, the question of how long this transfer may last is integral to understanding the effectiveness of endurance running as a coping strategy and may offer some insight into the addictive nature of exercise for alexithymic individuals (Manfredi & Gambarini, 2015).

This study found no significant impact of race distance on alexithymia, pre-race anxiety, or post-race anxiety. This may appear counterintuitive because one might reasonably expect that the longer and more arduous races might provide a more intense emotional experience and thus, a greater opportunity for emotion regulation. However, it is also likely that individuals will each have their unique distance range in which to glean an emotion regulation benefit. In other words, *challenge* is subjective; the relative difficulty of the race will depend on individuals' current fitness levels and the maximum distance that they can physically and mentally achieve. Such an individualized interpretation of the data would concur with findings from the exercise addiction literature in which it has been found that healthy participation in exercise can develop into an addiction as the benefits of participation become more difficult to achieve with increased tolerance (Freimuth et al., 2011; Hausenblas et al., 2017). Specifically, participants would first find benefit from relatively short runs but

as their tolerance (i.e., fitness) increases, they would have to increase the distance to experience the same level of intensity and to continue to feel the emotional benefit. The impact of race distance on the emotion regulation benefits of endurance running should be evaluated further in future research. Similarly, assessing the individuals' perspective of how difficult the race was for them and how satisfied they were with their performance may offer more insight on this issue.

While endurance running may not share the same level of risk as some addictions, participants may push themselves to the point of injury and then continue despite such an injury (Lichtenstein et al., 2017). Interestingly, when Hoffman and Krouse (2018) posed the question to a sample of ultrarunners (n = 1349), "If you were to learn, with absolute certainty, that ultramarathon running is bad for your health, would you stop your ultramarathon training and participation?", 74.1% answered "no". The authors concluded that despite ultrarunners exhibiting a high health orientation, a large portion of them would not stop running if continuing would endanger their health, as the psychological benefits were deemed too important to risk losing. This conclusion is supported by our findings, as they demonstrate that alexithymic individuals are gaining significant anxiolytic benefits from ultrarunning. Furthermore, with research linking alexithymia and exercise addiction (Manfredi & Gambarini, 2015; Van Landeghem et al., 2019), future research would do well to investigate the balance between the emotion regulation benefits of endurance running and the risk of injury through excessive running. This risk of injury may become particularly evident as the distance and frequency of participation required to gain an emotion regulation benefit increase, which leads to the question of the point at which pursuing these benefits might do more harm than good.

This initial investigation focused solely on alexithymia, and the inherent difficulties regulating emotion , as the moderating factor for anxiety reduction through extreme

endurance running. Further research is needed to identify if alexithymia is the key moderator of this relationship or whether other factors may play a part in the emotion regulation function of endurance running. For example, trait anxiety (an individual's propensity to feel anxious generally, rather than at a specific time) has been strongly and positively correlated with alexithymia (Honkalampi et al., 2018), although these are conceptually different traits. Alexithymia is thought to have a somewhat causational relationship with both state and trait anxiety (Karukivi et al., 2014). However, the research on how alexithymia and trait anxiety interact is limited. We believe that the combination of individuals' degree of alexithymia and their propensity to feel anxiety (i.e., trait anxiety) may provide a clearer picture of the personality type that seeks to regulate their emotions through an external source. One might hypothesize, for example, that the alexithymic anxiolytic benefits of endurance running will be more pronounced for those also high in trait anxiety.

Future research would do well to begin exploring the potential mechanisms that underpin the emotion regulation function of extreme endurance running for individuals high in alexithymia. Ultrarunners have described experiencing high levels of anxiety (Philippe et al., 2016) and strong emotions (Rupprecht & Matkin, 2012) during races. Building on Fenichel's (1939) counter-phobic theory, it is possible that the experience of an external and easily identifiable source of anxiety, and overcoming this anxiety, helps participants to feel greater agency in their emotions (see Barlow et al., 2013; Woodman et al., 2010). Similarly, pain has been identified as an inherent aspect of running extreme distances (Kirkby, 1996; Philippe et al., 2016; Rupprecht & Matkin, 2012). The experience of pain in this explicit and readily identifiable form may help alexithymic endurance runners to externalize the negative affect that they experience but cannot normally identify, describe, or regulate. Such a process is similar to the affect regulation model of self-harm (Gratz, 2003; Klonsky, 2007, 2009). It is noteworthy that endurance runners (Hanold, 2010; Rupprecht & Matkin, 2012) and self-

harmers (Edmondson et al., 2016) each experience pain as integral, comforting, and even enjoyable. One could argue that the pain experienced during endurance running would be a somewhat less destructive emotion regulation strategy than the self-inflicted pain more typical in the self-harm literature (e.g., Laye-Gindhu & Schonert-Reichl, 2005). Equally, endurance running with pain as a central feature may also be a sign of impending injury (Franken et al., 2006). We urge researchers to look in depth at the relationship between self-induced pain via running compared to pain associated with self-harm and to investigate the underlying mechanisms and effects of each. It is also perhaps noteworthy that despite pain in running and hardship in high-risk sports being likely central anxiolytic mechanisms, they remain unexplored.

Limitations

The main limitation of this study is clearly the modest sample size. Thus, despite having sufficient power for the analyses, the current study clearly warrants replication.

A further consideration is that the degree of alexithymia in this sample was moderate with scores on the TAS-20 ranging between 30 and 73. It would be interesting for future research to recruit participants who score on the high extremity of the TAS-20 scale. This would help to solidify endurance running as an effective emotion regulation strategy for those with extreme levels of alexithymia.

Conclusion

The findings of this paper provide a valuable initial insight into the affect regulation role of extreme endurance events for individuals high in alexithymia. This study offers a novel research avenue for exploring how endurance running may be beneficial for emotion regulation and offers some future directions for understanding the likely underlying mechanisms. Furthermore, the extension of the emotion regulation literature into endurance running invites questions regarding other anxiety-inducing environments that might provide

similar benefits. Clinically, endurance running might provide a relatively low-risk and accessible emotion regulation strategy for individuals who are at risk of turning to more maladaptive strategies, such as self-harm. However, the degree to which the emotion regulation function of endurance running and self-harm might be similar for individuals high in alexithymia clearly warrants further investigation.

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Table 1. Bivariate correlations, means, and standard deviations (n = 35).

	Pre-race anxiety	Post-race anxiety	Total alexithymia	DDF	DIF	EOT
Post-race anxiety	.55**					
Total Alexithymia	.49**	.13				
DDF	.41**	.08	.89**			
DIF	.65**	.24	.88**	.75**		
EOT	.06	-.04	.66**	.42*	.31	
Mean	37.20	31.69	47.03	12.26	15.46	19.31
SD	11.45	8.04	12.46	4.69	6.09	4.43

Notes. * $p < .05$, ** $p < .01$.

DDF = Difficulty Describing Feelings (5-25); DIF = Difficulty Identifying Feelings (7-35); EOT = Externally Orientated Thinking (8-40).

Table 2. The within-subjects moderation of alexithymia on anxiety pre- to post-race.

	Mean (SD)	b_0	b_1	t	LLCI	ULCI
Pre-race anxiety ($\hat{Y}_1$)	37.20 (11.45)	15.90	.45	3.26 **	.17	.73
Post-race anxiety ($\hat{Y}_2$)	31.69 (8.04)	27.63	.09	.77	-.14	.31
$\hat{Y}_1$ - $\hat{Y}_2$ difference	5.51 (9.69)	-11.73	.37	3.07 **	.12	.61

Notes: b_0 = Y intercept; b_1 = Unstandardized beta coefficient; Following the Judd et al. (2001) methodology, a significant $\hat{Y}_1$ - $\hat{Y}_2$ difference is evidence of a significant moderation of alexithymia on pre- to post-race anxiety.

**$p < .01$

Table 3. The within-subjects moderation of the subcomponents of alexithymia on anxiety pre- to post-race.

		b_0	b_1	t	LLCI	ULCI
DIF	Pre-race anxiety ($\hat{Y}_1$)	18.44	1.21	4.86 **	.71	1.72
	Post-race anxiety ($\hat{Y}_2$)	26.76	.32	1.43	-.14	.77
	$\hat{Y}_1$ - $\hat{Y}_2$ difference	-8.31	.89	3.90**	.42	1.36
DDF	Pre-race anxiety ($\hat{Y}_1$)	24.87	1.00	2.60*	.22	1.79
	Post-race anxiety ($\hat{Y}_2$)	30.00	.14	.46	-.47	.74
	$\hat{Y}_1$ - $\hat{Y}_2$ difference	-5.13	.87	2.66*	.20	1.53
EOT	Pre-race anxiety ($\hat{Y}_1$)	34.05	.16	.36	-.75	1.08
	Post-race anxiety ($\hat{Y}_2$)	33.12	-.07	-.24	-.72	.57
	$\hat{Y}_1$ - $\hat{Y}_2$ difference	.93	.24	.63	-.53	1.01

Notes: b_0 = Y intercept; b_1 = Unstandardized beta coefficient; DIF = Difficulty Identifying Feelings, DDF = Difficulty Describing Feelings, EOT = Externally Orientated Thinking.

*$p < .05$, **$p < .01$

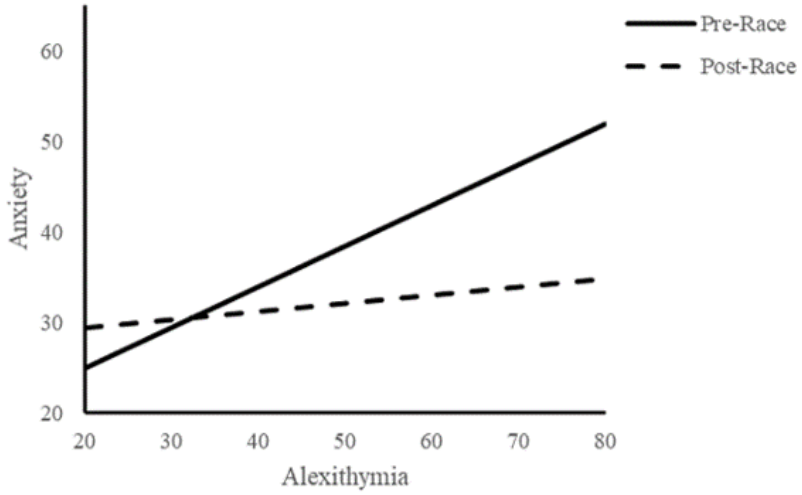

Figure 1.

Regression slopes for pre-race and post-race anxiety regressed on alexithymia as presented in Table 2, showing a significant alexithymia × anxiety interaction.